

CLAIMS

What is claimed is:

1. A microscale apparatus for separating cells, the apparatus comprising
 - a) a body defining a void having inlet and outlet regions and a separation region interposed between the inlet and outlet regions;
 - b) a cover contacting the body and covering at least the separation region of the void; and
 - c) a separation element disposed in the separation region of the void, the separation element having a plurality of flat portions, contacting the body, and defining a narrow passageway with the cover, wherein the flat portions are disposed at different distances from the cover.
2. The apparatus of claim 1, wherein the separation element is attached to the body.
3. The apparatus of claim 2, wherein the separation element is integral with the body.
4. The apparatus of claim 1, wherein one of the cover and the body defines a fluid inlet port in fluid communication with the inlet region and one of the cover and the body defines a fluid outlet port in fluid communication with the outlet region.
5. The apparatus of claim 4, further comprising a fluid displacement device for providing fluid to the fluid inlet port.
6. The apparatus of claim 1, wherein the void is filled with fluid.
7. The apparatus of claim 6, wherein cells are disposed in the inlet region.
8. The apparatus of claim 1, wherein the height of the narrow passageway, measured from the separation element to the cover, is in the range from 0.1 micrometer to 1000 micrometers.
9. The apparatus of claim 8, wherein the height of the narrow passageway, is in the range from 0.5 micrometer to 25 micrometers.
10. The apparatus of claim 8, wherein the height of the narrow passageway, is in the range from 1 micrometer to 16 micrometers.
11. The apparatus of claim 8, wherein the height of the narrow passageway is in the range from 1 micrometer to 10 micrometers.
12. The apparatus of claim 8, wherein the height of the narrow passageway is in the range from 1 micrometer to 5 micrometers.

13. The apparatus of claim 1, wherein one of the body, the cover, and the separation element defines a fluid channel for withdrawing fluid from the void at a step of the separation element.

5 14. The apparatus of claim 1, wherein one of the body, the cover, and the separation element defines a device for detecting a cell in the void at a step of the separation element.

15. The apparatus of claim 1, wherein one of the body, the cover, and the separation element defines a device for manipulating a cell in the void at a step of the separation element.

10 16. The apparatus of claim 15, wherein the device is a device for killing the cell.

17. The apparatus of claim 16, wherein the device is a heating element.

18. The apparatus of claim 1, wherein a surface has an antibody attached thereto and wherein the surface is selected from the group consisting of a surface of the separation element, a surface of the inlet region, a surface of the outlet region, and a surface of the cover.

15 19. An apparatus comprising two apparatus of claim 1, wherein the outlet region of the first apparatus of claim 1 is in fluid communication with the inlet region of the second apparatus of claim 1.

20 20. A method of separating cells, the method comprising providing the cells to the inlet region of the apparatus of claim 1 and thereafter collecting cells from one of a step of the separation element, the outlet region, and the inlet region.

21. The method of claim 20, wherein a fluid is passed from the inlet region to the outlet region after providing the cells to the inlet region.

22. The method of claim 20, wherein the cells are collected from a step of the separation element.

25 23. The method of claim 20, wherein the cells are cells of a blood sample and the collected cells are stem cells.

24. The method of claim 23, wherein the blood sample is a cord blood sample.

25. The method of claim 23, wherein the height of the narrow passageway is sufficient to permit passage of blood platelets therethrough.

30 26. A kit for separating cells, the kit comprising

a) a body defining a void having inlet and outlet regions and a separation region interposed between the inlet and outlet regions;

b) a cover adapted to fit the body and cover at least the separation region of the void; and

c) a separation element disposable within the separation region of the void, the separation element having a plurality of flat portions, such that when the kit is assembled, the cover contacts, the body, the separation element contacts the body, and the separation element defines a narrow passageway with the cover.

5 27. A microscale apparatus for separating cells, the apparatus comprising

- a) a body defining a void having inlet and outlet regions and a separation region interposed between the inlet and outlet regions;
- b) a cover contacting the body and covering at least the separation region of the void; and
- c) a separation element disposed in the separation region of the void, the separation element having a plurality of flat portions, contacting the cover , and defining a narrow passageway with the body, wherein the flat portions are disposed at different distances from the body.